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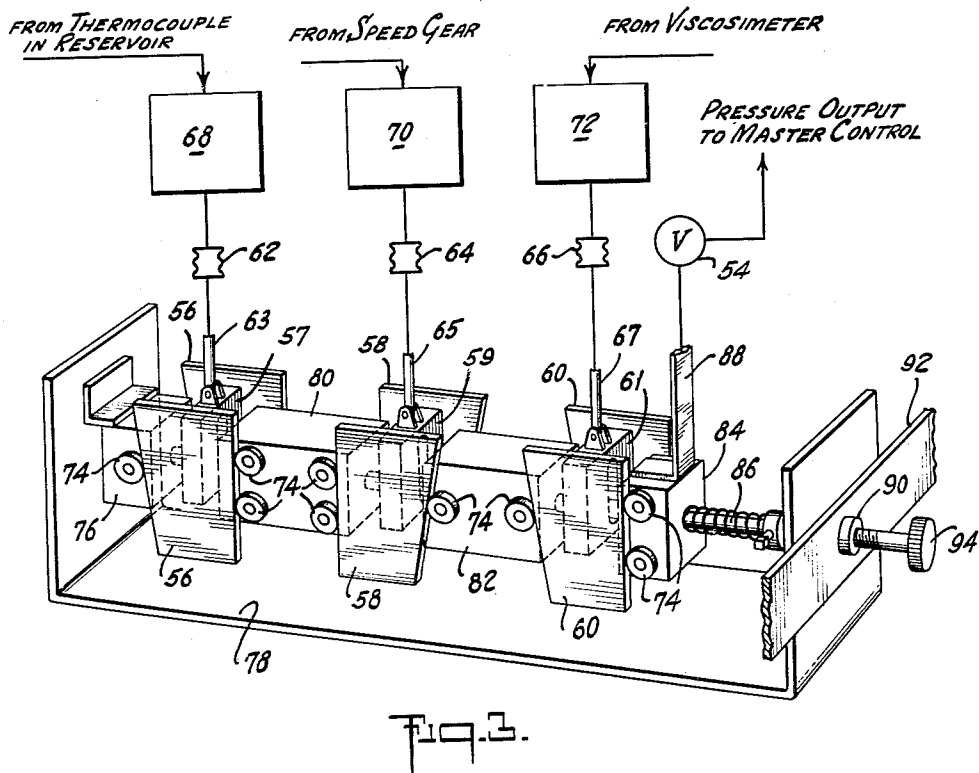
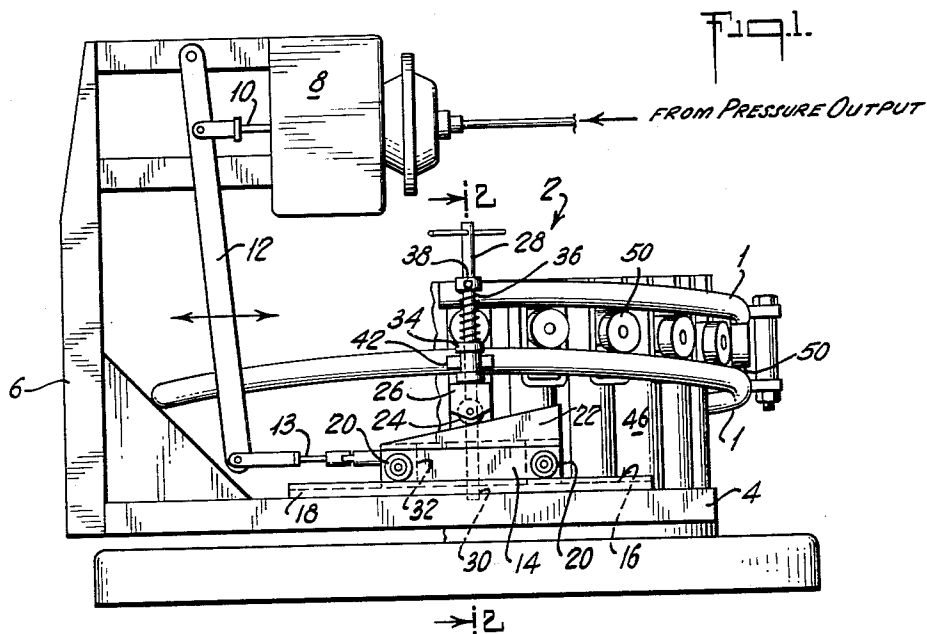
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2,961,013

POSITIVE DISPLACEMENT TYPE FLUID FILLING MACHINE
HAVING AUTOMATIC CAM TRACK ADJUSTING
MEANS AND METHOD OF FILLING

Filed April 28, 1958

2 Sheets-Sheet 1



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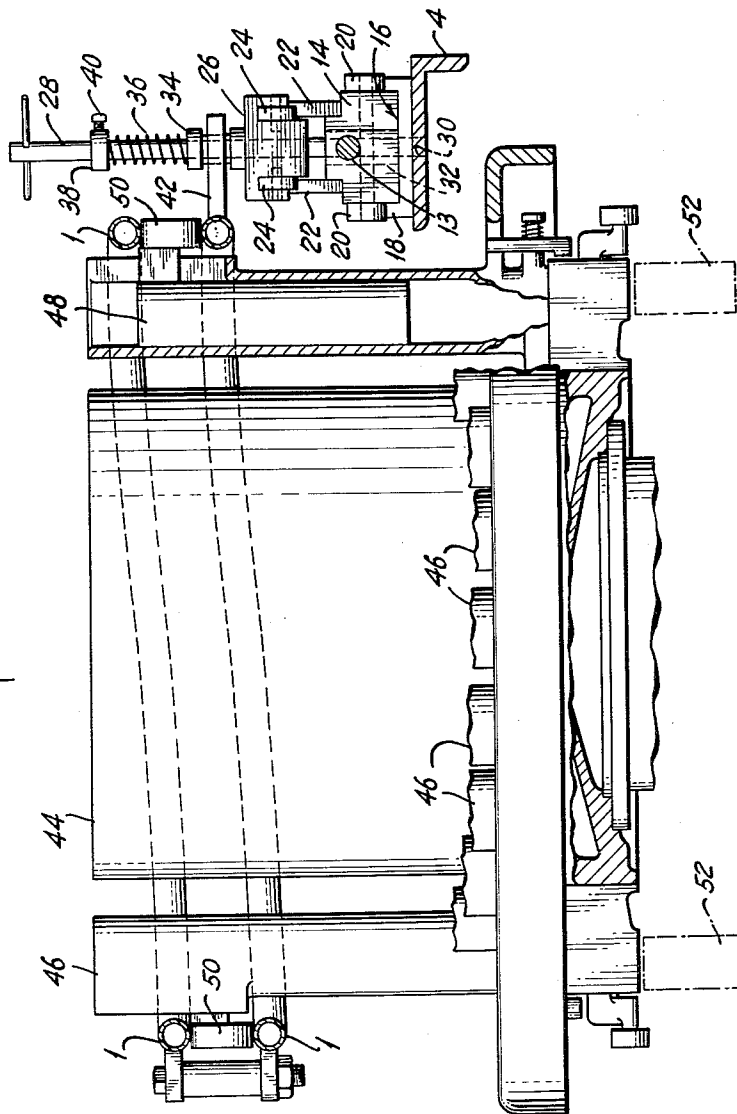
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Fig. 2.



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POSITIVE DISPLACEMENT TYPE FLUID FILLING MACHINE HAVING AUTOMATIC CAM TRACK ADJUSTING MEANS AND METHOD OF FILLING

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7 Claims. (Cl. 141-1)

This invention pertains to an improvement in a positive displacement type fluid filling machine wherein the positive displacement means is actuated by association with a cam track. More particularly, it relates to a means for automatically adjusting the cam track of a positive displacement type fluid filling machine to compensate for variables affecting the volume of fluid dispensed.

Underfilling and overfilling relative to the stated contents of containers being machine filled are the particular problems with which this invention is concerned. When machinery is used to fill containers the supplier must assure the consumer that the volume of fluid in the container is at least as much as stated thereon. The supplier must also protect himself against excessive loss through overfilling of the containers during the mechanical filling operation. The height or elevation of the cam tracks of most rotary positive displacement type filling machines is capable of manual adjustment in order to control the amount of fluid dispensed into each individual container. The operator of the filling machine must regulate the height of the cam track when underfilling or overfilling is observed. Variations in the amount of fluid individually dispensed often occurs during the filling process. The variations are caused by temperature changes causing an increase in fluid volume per weight unit, changes in viscosity caused by temperature change and by changes in the fluid stock, and changes in the speed of the rotary machine caused by the operator who must adjust the speed to accommodate various types of fluids.

The present invention is an improvement in a positive displacement type filling machine wherein the positive displacement means is actuated by association with a cam track. The improvement broadly comprises means for automatically adjusting the elevation of the cam track to compensate for variables affecting the volume of fluid dispensed. These automatic means include means for sensing the amounts of changes in said variables and means responsive to said changes for adjusting said cam track. Generally, these responsive means include elements for converting said changes to forces and means to transmit said forces to move the cam track. Further, means are included to combine the forces provided by the amounts of changes of a plurality of variables which combined forces are then transmitted to raise or lower the cam track. In particular, the means provided to combine the forces comprise a row of adjacent wedge members linearly moved by the forces and confined on one end by a stationary element and on the other by a spring biased element whereby linear movement of the wedge members is transmitted perpendicularly to the spring biased member. Means are associated with said spring biased member to transmit these combined linear movements to said cam track. The associated means comprise a horizontally slidable block having an inclined top surface, a horizontally stationary member mounted on said inclined surface, connecting

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means between said horizontally stationary member and said cam track, and means associated with said spring biased member to transmit horizontal motion to said slidable block.

The following is a more specific discussion of the invention made in connection with the accompanying drawings in which Fig. 1 is a front elevation of the master control mechanism for adjusting the cam track; Fig. 2 is a sectional view along line 2-2 of Fig. 1 with a side plan view of the master control mechanism; and Fig. 3 is a schematic and elevational view of the variable change sensing means for signaling the master control.

In Fig. 1, the cam track 1 is supported in part by the master control mechanism broadly designated as 2. The master control mechanism consists of base 4 having upright support 6 to which diaphragm valve 8 is securely attached. Diaphragm valve 8 actuates push rod 10 which in turn pushes or pulls lever 12. Lever 12 is connected by means of rod 13 to the slidable block 14 and by its movement imparts horizontal motion to the slidable block. Block 14 as seen in Fig. 2 extends down into the channel 16 of track 18 which is securely fastened to the base 4. This feature keeps the slidable block 14 in its proper horizontal path. Wheel members 20 mounted on block 14 and riding on track 18 reduce friction during the horizontal movement of block 14.

Block 14 carries inclined plane or riser members 22 fastened on top thereof which in turn supply the inclined tracks for wheels 24 of horizontally stationary block 26. The lower portion of block 26 extends down between the inclined plane members 22 thereby keeping block 26 properly oriented with respect to the slidable block 14.

Rod 28 is permanently fixed to the base 4 at 30 by threaded means or the like. Rod 28 extends through the slidable block 14 which has an elongated opening or slot 32 through the center portion thereof to allow it to slide back and forth. Rod 28 also extends through a hole in the horizontally stationary block 26 just large enough to accommodate it thereby preventing horizontal movement but allowing vertical movement.

Riding on top of block 26 and through which rod 28 extends is a positioning collar 34. Collar 34 is pushed downwardly against block 26 by the tension of spring 36 held by collar 38 adjustably positioned on rod 28 by means of set screw 40. Arm members 42 are permanently affixed to the bottom portion of cam track 1 and extend between the narrowed portion of collar 34.

The filling machine includes a reservoir 44 and a plurality of cylinders 46 in which pistons 48 move up and down as controlled by the position of the attached wheel members 50 riding in the cam track 1. It can be readily seen that the height of the cam track will determine the amount of fluid dispensed to the containers 52 riding below and accompanying the cylinders 46. This type of machine is well known in the art and is adequately described in such U.S. Patents as Nos. 1,254,190 and 2,666,564.

The diaphragm valve 8 receives the pressure output from a gas supply controlled by a valve 54 as seen in Fig. 3. The tapered plates or wedge members 56, 58 and 60 are secured respectively to slotted spacing members 57, 59, and 61. These wedge members are capable of vertical movement as controlled by the expansion and contraction of diaphragms 62, 64 and 66 through rods 63, 65 and 67.

The diaphragm 62 is supplied with varying amounts of gas under pressure from the temperature controller 68 in response to signals from the thermocouple in reservoir 44 of the dispensing machine.

The diaphragm 64 receives variable amounts of gas under pressure from the speed control 70 in response to a

signal of the change in the rotating speed of the filling apparatus by means of a gear and flexible cable or the like contacting the rotating element of the machine.

The diaphragm 66 receives variable amounts of gas under pressure from the viscosity control 72 in response to a signal from a conventional viscosimeter device. The viscosimeter receives a small amount of oil pumped through a tube from the reservoir at a constant flow rate. The differential pressure across a calibrated portion of the tube is sensed by a differential pressure cell and any change in viscosity of the fluid is signaled to the viscosity control 72.

These means described above for sensing the amounts of changes in the variables are those used in the present embodiment but other well-known means may also be used to function as sensing means.

The wedge member 56 having one or both vertical sides tapered, causes horizontal movement as it is lowered or raised between the wheel members 74. The stationary block 76 is securely fastened to the frame 78 to prevent movement in that direction however block 80, wedge 58, block 82, wedge 60 and spring biased block 84 are slidable on rod 86 and the vertical movement of the wedge 56 will cause horizontal movement to be imparted to the block 84. The force of this movement in turn will be transmitted through a rigid strap or rod 88 to the valve 54 thereby regulating it and controlling the pressure output to the diaphragm valve 8. In a like manner the vertical movements of wedges 58 and 60, caused by changes in speed of the machine or viscosity of the fluid, will be imparted to block 84 to vary the output through the valve 54. All 3 of the linear motions or forces initially caused by changes in temperature and viscosity of the fluid and the speed of the machine are combined in a single force and the resultant is used to regulate the valve 54 to control its pressure output.

The entire series of wedge members held by frame 78 is laterally adjustable relative to controls 68, 70 and 72. This adjustment is made by means of a microthreaded portion 90 of rod 86 which engages a stationary frame 92. The rod 86 has a microdial 94 affixed to its end for accurate lateral adjustment of the frame 78.

In operation the wedge members 56, 58 and 60 are moved vertically up or down during the operation of the filling machine to impart a combined linear motion to the block 84.

The shape of the wedge members 56, 58 and 60 are determined by the function for the particular variable for which they compensate. The tapered surfaces of the wedge members are curved surfaces which have been determined by mathematics or experimentation.

Block 84 through the rod 88 regulates valve 54 to control the pressure output to the diaphragm valve 8. The valve 8 receives this signal and transmits it through rod 10 to lever 12.

Lever 12 in the present embodiment is proportioned in such a manner that relatively small movement of the rod 10 connected to the diaphragm valve 8 is required for a comparatively large movement of the slidable block 14. The lever proportions and the angle of inclination of the tapered members 22 bear definite relationships. These were calculated so as to obtain a definite change in position of the cam track for each increment of pressure output supplied to the valve 8. As lever 12 is moved to the left it pulls the slidable block 14 along the track 18 thereby pushing the block 26 upwardly on rod 28. This upward motion is imparted to the collar 34 and through arms 42 to the cam track 1. As the lever 12 is moved to the right the slidable block 14 is also moved to the right and the horizontally stationary block 26 is caused to move downwardly on rod 28 followed by the collar 34 and the cam track 1.

Thus, it will be seen that variations in temperature of the fluid, viscosity of the fluid and the rotary speed of the machine will cause the cam track 1 to move up or

down to compensate for these changes which affect the volume of fluid to be dispensed to the containers 52. In operation, the device of the invention has insured full measure of filling of containers as indicated on the labels and great savings in preventing overfilling is attributed thereto.

Obviously, many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. In a positive displacement type filling machine wherein the positive displacement means is actuated by association with a cam track, the improvement which comprises means for automatically adjusting said cam track to compensate for variables affecting the volume of fluid dispensed which includes means for sensing the intensities of changes in said variables, means for converting said intensities to forces, adjacent wedge members linearly actuated by said forces, said adjacent wedge members confined on one side by a stationary element and on the other side by a spring biased member whereby a linear motion of a wedge member is transmitted to said spring biased member, and means associated with said spring biased member to transmit said motion to said cam track.

2. The improvement in a filling machine as described in claim 1 wherein the means associated with said spring biased member to transmit motion to said cam track comprises a horizontally slidable block having an inclined plane surface, a horizontally stationary member mounted on said inclined surface, means associated with said horizontally stationary member to move said cam track and means associated with the spring biased member to transmit horizontal motion to said slidable block.

3. A positive displacement type can filling machine wherein the positive displacement means is actuated by association with a cam track, the improvement which comprises means for automatically adjusting the position of said cam track to compensate for a plurality of variables affecting the volume of fluid dispensed which include means for sensing the intensities of changes in said plurality of variables, means responsive to said changes of said intensities in operative association therewith, and means joined to said last mentioned means for adding algebraically the forces arising from said intensities to provide a single force and for applying said single force to said cam track for adjusting said position of said cam track.

4. A positive displacement type can filling machine wherein the positive displacement means is actuated by changes in the height of a cam track, the improvement which comprises means for automatically adjusting said height of said cam track to compensate for more than one variable affecting the volume of fluid dispensed which includes means for sensing the intensities of changes in the variables, means in operative association therewith for converting said changes of said intensities to forces proportional thereto and means joined to said last mentioned means for combining said forces into a single force and to transmit said single force to said cam track for adjustment of said height of said cam track.

5. In the type of can filling machine as defined in claim 4, said means for automatically adjusting the height of said cam track to compensate for a variable affecting the volume of fluid dispensed being selected from the group responsive to changes in temperature and in viscosity.

6. In a method of filling cans to a predetermined volume by the use of a rotary, positive displacement type can filling machine wherein the volume of fluid to be dispensed is controlled by positive displacement means, the steps of continuously sensing the temperature of the fluid to be dispensed, rotating said can filling machine and the cans mounted thereon adjacent said positive displacement

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means for the filling of said cans, continuously sensing the speed of rotation of said can filling machine, transforming the intensities of the changes in these variables to forces proportional thereto, converting said forces to a single resultant force, operating said positive displacement means by horizontally stationary means adjustable in elevation, automatically applying said single resultant force to said stationary means for adjusting said elevation thereof and thereby changing the position of said positive displacement means to dispense a predetermined volume of fluid in response to changes in said variables.

7. In the method as defined in claim 6, the further steps of continuously sensing the viscosity of the fluid to be dispensed, transforming the intensities of changes in

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said viscosity to forces proportional thereto, and including said last mentioned forces in the conversion of forces into said single resultant force.

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